CLAIMS

What we claim is:

1. A method of producing an antimicrobial hard surface substrate comprising the steps of

a) providing a hard surface substrate;

b) providing a sol-gel precursor formulation comprising a host precursor component and at least one metal-containing antimicrobial agent;

c) compounding said sol-gel film precursor formulation to produce an adhesive sol-gel coating composition;

d) applying said sol-gel coating composition to at least a portion of said hard surface substrate; and

e) exposing said sol-gel coated hard surface substrate to a temperature of at most about 800°C to form a finished sol-gel film-coated hard surface substrate,

wherein said finished substrate exhibits a log kill rate for *Klebsiella pneumoniae* of at least 0.5 as measured under a modified plate contact method.

2. The method of Claim 1 wherein the log kill rate is at least 1.0.

3. The method of Claim 2 wherein the log kill rate is at least 2.0.

4. The method of Claim 3 wherein the log kill rate is at least 3.0.

5. The method of Claim 4 wherein the log kill rate is at least 3.5.

6. The method of Claim 1 wherein said metal-containing antimicrobial agent is selected from the group consisting of metal oxides, metal-containing ion-exchange compounds, metal-containing zeolites, metal-containing glasses, metal sulfadiazine, and any mixtures thereof.

7. The method of Claim 6 wherein said metal-containing antimicrobial agent is selected from the group consisting of silver oxide, silver-containing ion-exchange compounds, silver-containing zeolites, silver-containing glasses, silver sulfadiazine, and any mixtures thereof.

8. The method of Claim 6 wherein said host precursor is selected from the group consisting of TMOS, TEOS, aluminum acetylacetonate, titanium acetylacetonate, zirconium acetylacetonate, and any mixtures thereof.

9. The method of Claim 2 wherein said metal-containing antimicrobial agent is selected from the group consisting of metal oxides, metal-containing ion-exchange compounds, metal-containing zeolites, metal-containing glasses, metal sulfadiazine, and any mixtures thereof.

10. The method of Claim 3 wherein said metal-containing antimicrobial agent is selected from the group consisting of metal oxides, metal-containing ion-exchange compounds, metal-containing zeolites, metal-containing glasses, metal sulfadiazine, and

any mixtures thereof.

11. The method of Claim 4 wherein said metal-containing antimicrobial agent is selected from the group consisting of metal oxides, metal-containing ion-exchange compounds, metal-containing zeolites, metal -containing glasses, metal sulfadiazine, and any mixtures thereof.

12. The method of Claim 5 wherein said metal-containing antimicrobial agent is selected from the group consisting of metal oxides, metal-containing ion-exchange compounds, metal-containing zeolites, metal-containing glasses, metal sulfadiazine, and any mixtures thereof.

13. The method of Claim 2 wherein said host precursor is selected from the group consisting of TMOS, TEOS, aluminum acetylacetonate, titanium acetylacetonate, zirconium acetylacetonate, and any mixtures thereof.

14. The method of Claim 3 wherein said host precursor is selected from the group consisting of TMOS, TEOS, aluminum acetylacetonate, titanium acetylacetonate, zirconium acetylacetonate, and any mixtures thereof.

15. The method of Claim 4 wherein said host precursor is selected from the group consisting of TMOS, TEOS, aluminum acetylacetonate, titanium acetylacetonate, zirconium acetylacetonate, and any mixtures thereof.

16. The method of Claim 5 wherein said host precursor is selected from the group consisting of TMOS, TEOS, aluminum acetylacetonate, titanium acetylacetonate, zirconium acetylacetonate, and any mixtures thereof.

17. The method of Claim 3 wherein said metal-containing antimicrobial agent is a silver-containing ion-exchange compound.